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| 09/763,891 | 06/11/2001 | Takeshi Uchida | 566.39787X00 | 3852 |
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| ANTONELLI TERRY STOUT AND KRAUS SUITE 1800 1300 NORTH SEVENTEENTH STREET ARLINGTON, VA 22209 | | | EXAMINER | |
| | | | UMEZ ERONINI, LYNETTE T | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 1765 | |

DATE MAILED: 05/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

| | | | |
|-----------------|-------------------------|--------------|---------------------------|
| Application No. | 09/763,891 | Applicant(s) | <i>J</i> UCHIDA ET AL. |
| Examiner | Lynette T. Umez-Eronini | Art Unit | 1765 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 25 February 2003.

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-32 is/are pending in the application.

4a) Of the above claim(s) 19-22 is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1-18 and 23-32 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) 19-22 are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) All b) Some * c) None of:
1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) Notice of References Cited (PTO-892) 4) Interview Summary (PTO-413) Paper No(s). _____.
2) Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) Notice of Informal Patent Application (PTO-152)
3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) Other:

DETAILED ACTION

This communication is in response to applicant's request for clarification, and a complete office, filed February 25, 2003. Applicant also requested that the period for response of the Office Action mailed February 4, 2003, be re-set to begin with the mailing date of the aforementioned Office Action because of the inconsistency between the Office Action Summary, indicating claims 1-18 and 23-28 are rejected and the Detailed Action of the Office Action, which does not set forth a basis for the rejection either claims 10 and 24. The previous rejection in Office Action mailed February 4, 2003 is withdrawn. A new rejection is set forth and the period for response has been reset.

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:

- I. Claims 1-18 and 23-28, drawn to polishing solution, classified in class 252, subclass 79.1.
- II. Claims 19-22 and 29-33, drawn to polishing method, classified in class 438, subclass 692.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as product and process of use. The inventions can be shown to be distinct if either or both of the following can be shown: (1) the process for using the product as claimed can be practiced with another materially different product or (2) the product as claimed can be used in

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a materially different process of using that product (MPEP § 806.05(h)). The process for using the product as claimed can be practiced with another materially different product that does not require protective film forming agents that differ. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

3. Because these inventions are distinct for the reasons given above and the search required for Group I is not required for Group II, restriction for examination purposes as indicated is proper.

4. During a telephone conversation with William Solomon on December 17, 2002 a provisional election was made with traverse to prosecute the invention of Group I, claims 1-18 and 23-28. Affirmation of this election must be made by applicant in replying to this Office action. Claims 19-22 and 29-33 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

5. Applicant is reminded that upon the cancellation of claims to a non-elected invention, the inventorship must be amended in compliance with 37 CFR 1.48(b) if one or more of the currently named inventors is no longer an inventor of at least one claim remaining in the application. Any amendment of inventorship must be accompanied by a request under 37 CFR 1.48(b) and by the fee required under 37 CFR 1.17(i).

Specification

6. The disclosure is objected to because of the following informalities: On page 13, line 3, "ozoe" should read --ozone--. Appropriate correction is required.

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

8. Claim 1-4, 7-9, and 16 is rejected under 35 U.S.C. 102(b) as being anticipated by Sasaki et al. (US 5,770,095).

Sasaki teaches a polishing solution for a metal which contains:

an oxidizing agent (column 4, lines 50-52);

an amino acetic acid (such as glycine, column 4, line 2) and/or an amidosulfuric acid (column 4, lines 50-52), which is the same as applicant's oxidized-metal dissolving agent and second protective film forming agent oxidized-metal dissolving agent;

benzotriazole (column 4, lines 50-52), which is capable of forming a chelate compound of a complex with the film material (i.e. metal, column 8, lines 2-4) to be etched (column 8, lines 20-24) and which "functions as a protection film to suppress oxidization or corrosion (of the Cu film) . . . in the presence of an

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etching agent having a chemical corrosion range in which Cu can be etched at a high rate" would inherently read on, a first protective-film forming agent; and

(4) water (column 4, lines 50-52).

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

10. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki et al. (US 5,770,095) in view of Kawakubo et al. (US 5,691,219) and further in view of Ronay (US 5,876,490).

Sasaki differs in failing to specify compounds that are second protective-film forming agents, as recited **in claim 5**.

Kawakubo teaches a polishing solution, which contains an organic solvent such as alcohol and ester and which shortens the time of polishing (column 5, lines 25-32 and 35-37), which is the same as applicant's second protective-film forming agent.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention by modifying Sasaki's polishing solution by adding a second protective-film forming agent such as an

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ester, as taught by Kawakubo for the purpose of shortening the polishing time, which ultimately decreases the manufacturing cost of the semiconductor device.

Sasaki in view of Kawakubo differs in failing to specify compounds that are second protective-film forming agents as recited in **claim 6**.

Ronay teaches a slurry that comprises abrasive particles and polyelectrolyte (polyions), (column 4, lines 55-56), which can be bound to the polishing abrasive particles, which includes acidic groups such as poly(acrylic acids) (column 5, lines 26-31) and which is the same as applicant's second protective-film forming agent.

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sasaki by using the second protective-film forming agent as taught by Ronay for the purpose of improving planarization (column 6, line 67 - column 7, line 3).

11. Claim 10 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki ('095) as applied to claim 1 above, and further in view of Chopra et al. (US 6,206,756 B1).

Sasaki differs in failing to teach said oxidized-metal dissolving agent is at least one selected from the group consisting of malic acid, tartaric acid, citric acid, ammonium maliate, ammonium tartarate and ammonium citrate.

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Chopra teaches a chemical mechanical polishing solution that comprises a pH buffer with ammonium citrate (same as applicant's oxidized-metal dissolving agent), (column 2, lines 51-55 and column 2, lines 54-58).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sasaki in view of Kawakubo and Ronay by using Chopra's ammonium citrate, which is the same as applicant's oxidized-metal dissolving agent for the purpose of maintaining a polishing solution that has a constant pH (Chopra, column 2, lines 52-53)

12. Claim 17 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki ('095) in view of Kawakubo ('219) and Ronay ('490), as applied to claim 1 above, and further in view of Hayashi et al. (IDEM, 1992).

Sasaki in view of Kawakubo and Ronay differs in failing to teach the polishing, which substantially does not contain any abrasive grains.

Hayashi teaches an abrasive-free, chemical-mechanical-polishing technique in which aqueous amine and hydrogen peroxide solution is used as a polishing liquid (p. 976, 1st paragraph).

It is the examiner's position to modify Sasaki by using an abrasive free polishing liquid as taught by Hayashi for the purpose of minimizing scratches of the polished surface.

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13. Claims 11-14, 18, 23, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki ('095) in view of claim 11 in view of Berenz et al. (US 4,53,654).

Sasaki teaches a polishing rate as high as 350 nm/min and the etching rate as high as 45 nm/min (column 7, lines 29-30 and FIG. 3), which reads on having a chemical mechanical polishing rate of 100 nm/minute or higher.

Sasaki also teaches a polishing solution for a metal which contains: an oxidizing agent (column 4, lines 50-52); an amino acetic acid (column 4, lines 50-52), which is the same as applicant's second protective film forming agent oxidized-metal dissolving agent; benzotriazole (column 4, lines 50-52), which is capable of forming a chelate compound of a complex with the film material (i.e. metal, column 8, lines 2-4) to be etched (column 8, lines 20-24) and which "functions as a protection film to suppress oxidization or corrosion (of the Cu film) . . . in the presence of an etching agent having a chemical corrosion range in which Cu can be etched at a high rate" which reads on, a first protective-film forming agent, which is a compound capable of forming a protective film by forming chemical linkage on the metal film surface.

Since Sasaki's amino acid is the same as applicant second protective-film forming agent and makes up a polishing liquid that also comprises BTA (the same as applicant's first protective-film forming agent, then using the combination of Sasaki's polishing solution which contains the same compounds as applicant's first- and second- film forming agent would result in a first

protective-film forming agent and a second protective-film forming agent different from the first protective-film forming agent; a first protective-film protective film forming agent which is a compound capable of forming a protective film by forming physical adsorption and/or chemical linkage on the metal film surface; and a second protective-film forming agent which is a compound which assists the first protective-film forming agent in forming a protective film, as claimed in the present invention.

Sasaki further teaches the polishing agent comprises water (column 4, lines 50-52).

Sasaki differs in failing to teach the polishing solution has an etching rate of 10 nm/minute or lower, in claim 11 and 1 nm/minute or lower, in claim 12

Berenz teaches the etching rate and other parameters may vary (column 1, lines 30-31).

It is the examiner's position that it would have been obvious to one having ordinary skill in the art at the time of the claimed invention to modify Sasaki by varying the etching rate as taught by Berenz, which provides evidence that the etching rate is a so-called "result effective variable, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617, F.2d 272, 205 USPQ 215 (CCPA 1980).

14. Claim 27 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki ('095) in view of Berenz ('654) as applied to claim 11 above, and further in view of Hayashi et al. (IDEM, 1992).

Sasaki in Berenz differs in failing to teach the polishing, which substantially does not contain any abrasive grains.

Hayashi teaches an abrasive-free, chemical-mechanical-polishing technique in which aqueous amine and hydrogen peroxide solution is used as a polishing liquid (p. 976, 1st paragraph).

It is the examiner's position to modify Sasaki in view of Berenz by using an abrasive free polishing liquid as taught by Hayashi for the purpose of minimizing scratches of the polished surface.

Claim Rejections - 35 USC § 102

15. Claims 15 and 26 are rejected under 35 U.S.C. 102(b) as being anticipated by Sasaki (095).

Sasaki teaches a polishing solution for a metal which contains:
an amino acetic acid (column 4, lines 50-52), which is the same as applicant's second protective film forming agent oxidized-metal dissolving agent; and

benzotriazole (column 4, lines 50-52), which is capable of forming a chelate compound of a complex with the film material (i.e. metal, column 8, lines 2-4) to be etched (column 8, lines 20-24) and which "functions as a protection film to suppress oxidization or corrosion (of the Cu film) . . . in the presence of an etching agent having a chemical corrosion range in which Cu can be etched at a high rate" would inherently read on, a first protective-film forming agent, which is

a compound capable of forming a protective film by forming chemical linkage on the metal film surface.

Since Sasaki's amino acid is the same as applicant second protective-film forming agent and makes up a polishing liquid that also comprises BTA (the same as applicant's first protective-film forming agent, then it would be inherent that the combination of Sasaki's polishing solution which contains the same compounds as applicant's first- and second- film forming agent would inherently assist the first protective-film forming agent in forming a protective film, as claimed in the present invention.

16. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sasaki ('095) as applied to claim 15 above, and further in view of Hayashi et al. (IDEM, 1992).

Sasaki differs in failing to teach the polishing, which substantially does not contain any abrasive grains.

Hayashi teaches an abrasive-free, chemical-mechanical-polishing technique in which aqueous amine and hydrogen peroxide solution is used as a polishing liquid (p. 976, 1st paragraph).

It is the examiner's position to modify Sasaki by using an abrasive free polishing liquid as taught by Hayashi for the purpose of minimizing scratches of the polished surface.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner is normally unavailable on the First Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-972-9310 for regular communications and 703-972-9311 for After Final communications.

Itue
May 2, 2003


WILLIAM A. POWELL
PRIMARY EXAMINER